Dedicated devices and techniques – a cornerstone in recanalisation of chronic total occlusions of coronary arteries

Leszek Bryniarski[1], Piotr Kusak[1], Sławomir Surowiec[1], Dariusz Dudek[2], Danuta Czarnecka[1]

[1]1st Department of Cardiology, Interventional Electrocardiology and Hypertension, University Hospital, Krakow, Poland
[2]Department of Interventional Cardiology, University Hospital, Krakow, Poland

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Abstract

Recanalisation of chronic total occlusion (CTO) is still a challenge in invasive cardiology, requiring operator experience, equipment, and techniques dedicated to CTO. Due to difficulties in crossing the lesion by wire and by balloon (both responsible for 98% of the procedure's failures), many helpful techniques have been described. We report the case of both Tornus system and anchor technique in successful recanalisation of a right coronary artery.

Key words: chronic total occlusion, Tornus system, anchor techniques.

Introduction

Recanalisation of chronic total occlusion (CTO) is still a challenge in invasive cardiology, requiring operator experience, equipment, and techniques dedicated to CTO [1]. Due to difficulties in crossing the lesion by wire and by balloon (both responsible for 98% of the procedure's failures [2]), many helpful techniques have been described.

We report the case of both Tornus system and anchor technique in recanalisation of a right coronary artery (RCA).

Case report

We report the case of an 83-year-old male with hypertension, hypercholesterolaemia, permanent atrial fibrillation, and chronic heart failure. The patient's history showed that he had undergone two myocardial infarctions and percutaneous coronary intervention (PCI) of the circumflex artery. The left anterior descending artery (in the 7th segment) and RCA (in the 2nd segment) had been previously closed, and the second diagonal branch had been 80% stenosed (coronary angiography in June 2013) (Figure 1). Due to persistent symptoms the patient was qualified to PCI of RCA in our centre specialising in CTO 4 months later.

Femoral 7 F access was used to engage the artery. A Judkins Right 4.0, 7 F catheter was used. ULTIMATE bros 3 wire (Asahi, Japan) was able to cross the lesion, but a 1.5 mm × 15-mm OTW Apex Push balloon (Boston Scientific, USA) was not. In spite of some inflations with 1.5 mm × 15-mm OTW Apex Push balloon and 1.0 mm × 10 mm Sapphire II (OrbusNeich, Hong Kong) balloon in the proximal part of the occlusion, there was no possibility to cross the lesion by balloon catheter. To create enough room in the occlusion we tried to use a Tornus 2.1 Fr system (Asahi, Japan), but without a success. To have better support we used a BMW Universal II (Abott, USA) wire and a 2.5 mm × 15-mm Maverick balloon (Boston Scientific, USA) placed in the right coronary branch. The balloon was inflated to 12 atm (Anchor technique) (Figure 2). As a result we were able to efficiently pass through the occlusion with the Tornus system. Subsequently, a 2.5 mm × 15-mm Maverick balloon catheter was used to cross the lesion. Predilatation with 12 atm was made. An Alex (Balton, Poland) 3.0 mm × 22-mm stent (sirolimus eluting stent) inflated to 14 atm was deployed with very good effect (Figure 3). The total time of fluoroscopy was 22.5 min, and the patient received 1.364 Gy of radiation. The total amount of contrast medium was 230 ml. After 9 months of follow-up the patient is asymptomatic.

Discussion

Previously, coronary artery by-pass graft (CABG) was very often the treatment of choice in chronic total oc-

Corresponding author:
Piotr Kusak MD, 1st Department of Cardiology, Interventional Electrocardiology and Hypertension, University Hospital, 17 Kopernika St, 31-501 Krakow, Poland, phone: +48 12 424 73 00, e-mail: kusakpiotr@gmail.com
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Figure 1. CTO of RCA (closure in the 2nd segment)

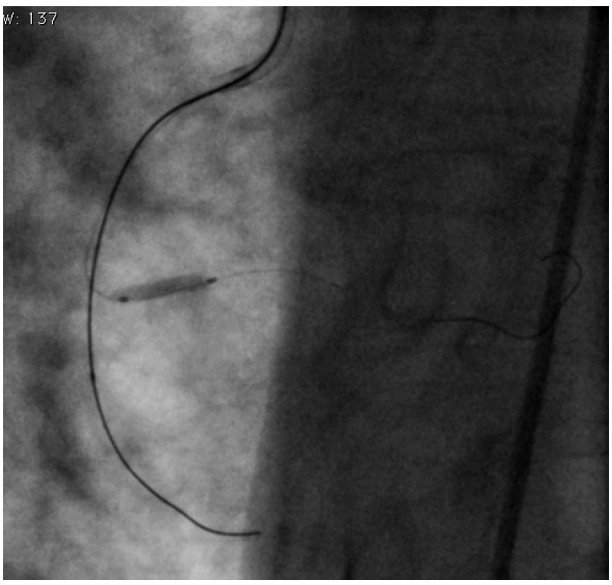

Figure 2. Ultimate Bros 3 wire across the lesion and marker of the Tornus system, creating space in the occlusion. Anchor technique (BMW Universal II with 2.5 mm × 15 mm Maverick MONORAIL balloon catheter in the right coronary branch)

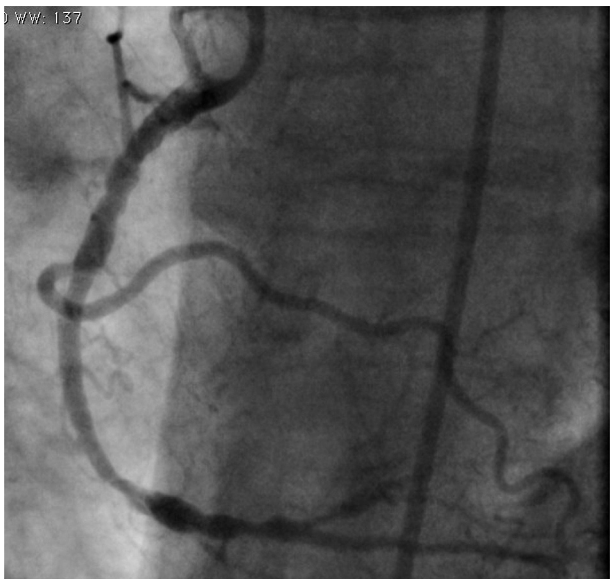

Figure 3. The effect of the procedure after stent implantation

clusions. The development of equipment and greater experience of the operators resulted in a higher rate of successful percutaneous revascularisations in CTO. The most important advantages of percutaneous coronary interventions, as a less invasive procedure compared to CABG, include symptom relief, very often improvement of the left ventricular function, and improvement of the survival rate [3–6]. In our case, we described the complex procedure of CTO in symptomatic patient using a Tornus system and anchor technique.

Although about 89% of procedure failure is due to problems with the wire crossing the lesion, we were able to cross the occlusion, but we were unable to do so using the balloon. In such situations, the Tornus system is a useful device to create enough room in the occlusion, as we described previously [7]. Another problem is support during the procedure. Because of calcifications and stiffness of the lesions, typical techniques of coronary angioplasty are not enough. There are different possibilities to have better support; one of which is an anchor technique. The anchor technique delivers better guiding-catheter stabilisation, greater power of the guide wire, and better possibility to cross the lesion by the balloon and stent. The technique requires "anchoring" by the wire or by the inflated balloon in the other vessel (proximally or distally to the lesion). This technique is not only helpful during crossing, balloon, or stent delivering, but also during creation of a space in the lesion by the Tornus system. The Tornus system requires a very good support, due to the force required by the operator. In our case, only after "anchoring" the balloon in the second vessel were we able to efficiently use the Tornus system.

Success in CTO procedures depends on various elements. As a non-standard angioplasty, very often, combined techniques are needed. If other techniques are unable to cross the occlusion, the anchor technique should be considered as an alternative.

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